WILD BOAR MANAGEMENT IN AGRICULTURAL ECO SYSTEM

Project Co-ordinating Unit

All India Network Project on Agricultural Ornithology

Indian Council of Agricultural Research (ICAR)

ANGRAU, Rajendranagar, Hyderabad - 500 030

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GOVERNMENT OF INDIA
DEPARTMENT OF AGRICULTURAL RESEARCH & EDUCATION
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Message

Plant protection practices in agricultural crops has taken paradigm shift in the recent times, in view of the emerging threat of vertebrate pest menace in major cropping systems. Wild boar and Nilgai have become real concern damaging farmers crop. Wild boar, by being more pronounced in its penetration into the agricultural ecosystem from its original habitat, forced the researcher in developing effective management strategies. An entity which is protected through Schedule III Wild Life Protection Act (1972) needs cautious approach unlike other pests for which efficacy of the method developed is of prime importance.

In this context, I sincerely appreciate the interest taken by Dr. V. Vasudeva Rao, Project Coordinator, AINP on Agricultural Ornithology and his team in developing efficacious and also eco-friendly methods to manage in various cropping systems. Many of these methods are ecologically safe and economical. Compiling the validated wild boar management practices in different crops developed so far is certainly the need of the hour, beyond doubt. I congratulate, Dr. V. Vasudeva Rao and his team for conceiving the idea of bringing out a bulletin entitled **"Wild boar management methods in Agricultural eco system".** This compilation in the form of bulletin will certainly help the scientific community to take up focused research to manage this pest within the existing legal frame work.

Dated the 16th January, 2013
New Delhi

(S. Ayyappan)

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Message

Agricultural production is influenced by several factors among which damage done by vertebrate pests is gaining importance during the recent times. The damage done by Wild boar and Nilgais are proving to be major constraint in cultivation of several crops of Agricultural and Horticultural importance. Wild boar management has become imperative in certain pockets of India without which it is becoming extremely difficult to save the crops. AINP on Agricultural Ornithology by being nodal agency has worked relentlessly under the able leadership of Dr. V. Vasudeva Rao to come out with effective and economical management strategies for this noxious animal which is giving sleepless nights to the farming community.

I appreciate the efforts and acknowledge the pains taken by Dr. V. Vasudeva Rao and his team in compiling Wild boar management practices in a crisp and concise manner in the form of bulletin entitled **"Wild boar management methods in Agro eco system".** I hope and wish that this book will act as guiding manual for the people involved in wild boar management.

S. K. Datta

(Swapan Kumar Datta)

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Message

Man animal conflict is a basic reason for many of the aberrations happening in the natural eco systems. Destruction of forests areas which is a natural habitat for the Wild animals forced them to change their feeding guild to cultivated crops. Wild boar menace being faced in agricultural crops is one of such befitting example to cite. Traditional plant protection measures developed so far are more designed for insect pests, weed and disease management, there by necessitating a situation to modify, validate and implement plant protection techniques meant for vertebrate pests management.

In this direction, AINP on Agricultural Ornithology has come out with conclusive management practices, which are practically and also legally implementable at ground level.

I take this opportunity to congratulate Dr. V. Vasudeva Rao, Project Coordinator, AINP on Agricultural Ornithology and his team for bringing out this valuable publication to be used as reference manual by the people involved either directly or indirectly in plant protection in general and wild boar management in particular.

(T.P. Rajendran)

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Foreword

There is no second thought about agriculture being the backbone of Indian economy. Despite such crucial role being paid by agriculture, certain constraints pertaining to crop protection have always been a bottle necks in agricultural growth. Among the several hurdles, the pest damage encountered in the crops by insects, diseases, weeds and other vertebrate pests are of prime importance, which need to be tackled both strategically and logically. Vertebrate pest management, since several years, has been put on back burner in view of the dominating role played by other invertebrate pests. However, at present, the situation has completely changed in view of the alarming level of the damage caused by certain group of vertebrates such as birds, rodents, wild boars, nilgais and monkeys. The present situation resulted in to bestowing of the attention by Indian Council of Agricultural Research (ICAR) through establishment of All India Network Project on Agricultural Ornithology and All India Network Project on Rodents.

All India Network Project on Agricultural Ornithology (AINPAO) has also been given undaunted task of the developing of management for wild boars, nilgais and monkeys in addition to their mandated work on ornithology.

In the light of such huge responsibility, AINP on Agricultural Ornithology took up the challenge and succeeded in bringing out the status and distribution of the vertebrate pests in general and wild boars, in particular. Wild boar (*Sus scrofa*), is in the present times, considered as major threat to many of the cultivated crops irrespective of region and locality. Such grevious situation has to be tackled immediately and the information on status and distribution of wild boar generated by AINP on Agricultural Ornithology acted as an excellent platform for development, evaluation and validation of several management practices ranging from physical barriers, biological barriers and chemical methods in addition to scientific validation of the traditional methods invented by the farming community, themselves. As a result, of such sternous efforts, the wild boar management has been made efficacious, ecologically safe and economically viable for the Indian farming community.

The present bulletin entitled **"Wild Boar Management in Agricultural Ecosystem"** is thorough and systematic compilation of the all information on wild boars which can be a useful tool in the hands of scientific community, implementing agencies, extension personnel and ultimately to the average Indian farmer.

(V. Vasudeva Rao)

Agricultural production in India is mainly affected by insect pests, plant diseases, and weed plants to a greater extent. In the recent times, avian fauna mainly consisting of depredatory birds and mammals with special reference to rodents, wild boars, blue bulls and monkeys started gaining pest status, and in certain cases a huge damage is being encountered due to some of these vertebrate pests. Among them, wild boar has become regular menace for farmers in major crops resulting into enormous damage. Unlike other pests, which generally attack during a particular stage of the crop, wild boars cause damage right from seedling stage to till the maturity of the crop. The basic reason for such unexpected abrupt raise in the populations of wild boar can be attributed to escalating rate of deforestation, which otherwise is the natural habitats of the wild boar. Deforestation also resulted in the decline of tigers, panthers, wild dogs, wolf, and jackal, which are the natural predators for wild boars, there by indirectly contributing to the phenomenal raise in the wild boar populations. Over exploitation of forest resources by the mankind forced wild boars out of their natural habitat and compelled them to depend on cultivated crops such as rich, maize, sorghum, pulses, oil seeds, fruits & vegetables. The damage caused by wild boar is more alarming than their actual feeding in the crop. Wild boar damage is more pronounced in crop fields which are in close proximity with adjoining forests areas. Wild boar, in general, move in groups and their activity is more at dawn & dusk than in the actual day period. They have also a unique feature of identifying cropped areas through their extraordinary smell sensory mechanism.

Full grown Male and Female Wild Boar

Prominent identification feature - distinct sparser coat and mane of black bristles reaching from the nape down the back

Foraging activity of group of Wild Boars in adjoining Forests arear

All India Network Project on Agricultural Ornithology is one specialized project along with All India Network Project on Rodent Control to deal with the problems relating to vertebrate pests of Agricultural importance. AINP on Agricultural Ornithology, while exclusively dealing with birds of agricultural landscape, has also taken up the task of developing, evaluating and validating the management practices of vertebrates such as wild boar, blue bull & monkeys. Keeping in view, the escalating the amount of damage due to the wild boars in agricultural crops, AINP on Agricultural Ornithology has identified the intensity and extent of damage both through traditional surveys and also by using modern GIS / GPS tools. On the basis of such data available, information generated, provided an excellent platform to create awareness among different stake holders and farming community.

Basic details of Wild boar (*Sus scrofa*)

To develop effective management strategies for any agricultural pests there is an imperative need to know its origin, distribution, habit, habitat, feeding and reproductive behavior.

Taxonomic origin

The wild boar (Sus scrofa) belongs to the order Artiodactyla, family: Suidae, Sub family: Suinae and sub order: Suiformes. Wild boars are listed under Schedule III species of Wild Life Protection Act, 1972.

The wild boar has distinct sparser coat and fuller crest or mane of black bristles reaching from the nape down the back. The color of the animal is black mixed with grey rusty brown, and white hairs. The young are brownish and grown up pigs are grayish in colour. New born wild boar are brown with light or black stripes on their back. A well grown stands 90 cms high at the shoulder and its weight may range between 135 – 230 kg while female ranges between 85 – 135 kg.

Feeding Activity of Wild Boar with young ones during dawn period

Nocturnal foraging activity of wild boar

They have a longer and narrower snout, smaller and more erect ears and a larger and straighter tail with a tuft at the end. The wild boars have incisor teeth in the upper jaws. Their molar teeth when unworn are capped with small hillock-like columns. The tushes (canines) are well developed in the males. The lower tusks grow as long as 32 cm. on the outside curve. Both the upper and lower tushes curve outwards and project from the mouth. As they are not ruminants, their stomach is much less complexed and consists of a single chamber. Their feet are narrow and have the bones of the four toes complete. The petty toes are completely developed but do not touch the ground while walking. The cannon bones are not developed in the feet.

Distribution

The wild boar is one of the most widely distributed terrestrial mammals and has by far the largest range of all Suiformes. The species now occur in pure wild or barely modified feral form on all continents except Antarctica and on many oceanic islands. It is found throughout the steppe and broad-leaved forest regions of the Palaearctic from Western Europe to the erstwhile Soviet far east, extending southwards as far North Africa, the Mediterranean basin and the Middle east, through India, Indo-China, Japan, Taiwan and the Greater Sunda Islands of South-east Asia. It is common in the whole of India except Jammu and Kashmir, upper Himalayas and desert, Sri Lanka, Burma and Tenasserim, Syria and part of the Malay Peninsula.

Pre-mating Behaviour

Mating Behaviour

Providing food to the young once

Habit and Habitat

By being widely distributed in India, wild boars prefer grasslands, scanty bush jungles, forests and agricultural eco systems. They are omnivorous in nature. Their main food includes, roots, tubers, bulbs, insects, snakes and small mammals. They generally move in groups and the group size varies between 15 -35 and home range varies between males and females. Climate, population density and food availability are the influencing factors for the extent of home range. They have an excellent smell detection sensory mechanism by using which they identify host crops to feed on. Their activity of feeding is more pronounced during dawn and dusk periods. They cause an extensive damage to the crops. They use crops both for food and shelter. On the other hand, by burrowing deep into the soil with a strong snout wild boars indirectly help in improving in the soil aeration, increase the permeability of water, accelerate the decay of leaf litter and reduce insect pests by eating the exposed grubs and also control long grass and unwanted weeds.

Reproductive behavior

Wild boars are prolific breeders and apparently breed throughout the year. The reproduction period in wild boar s is seasonal and mostly correlated with availability of food and other climatic factors. The males are sexually mature between the ages of 5 and 7 months and females between 4 and 6 months. The males reach the sexual maturity in 15 to 24 months but they will not mate until they have reached their full size at five years of age, and females at 18 months of age. Females have an estrous cycle of 21 days and are generally receptive for 2 -3 days. The gestation period is about 4 months and in general 5 -12 young ones are born at a time and mostly seen after the rains. While males are usually aggressive during the rut, the females are territorial and very protective of their young during furrowing and for some time afterwards. Wild boars are potentially dangerous because of their size and their tusk but they don't attack unless provoked.

SOCIAL GROUPS OF WILD BOARS IN DIFFERENT HABITATS

In other counties such as USA, wild boars are controlled by hunting, caging and shooting. Poison baits on a large scale are widely used method in Pakistan for managing the wild boars. In Bhutan on the other hand, trained group of farmers hunt the wild boars. Italy is a country where wild boar menace is kept under check by using sodium mono floro acetate (or) warfarim. In several other countries like England, Poland, Russia and Japan it is common to control wild boars by poison baits, hunting, shooting, catching, electrocution and translocation.

Despite the above methods being effective in Wild boar management, none of them are applicable for Indian conditions as wild boars have been listed animals in Schedule III of Wild Life Protection Act 1972. Any method resulting into either intentional or unintentional death of the animal is directly punishable. In the light of such situations development of wild boar management practices in India need to be strategic, logical, economical and above all must be legally sound in the light of the Wild Life Protection Act.

By keeping in view the enormous damage being caused by the wild boars, AINP on Agricultural Ornithology put extensive efforts in studying the behavioral at aspects of wild boar to come out with certain management practices developed on the basis of the animal's activity, feeding behaviour and reproductive ability. The following are some of the management practices developed, evaluated and validated by AINP on Agricultural Ornithology and can be used by the farming community efficiently and effectively for wild boar management.

Physical Barriers

Barbed Wire Fence around the Crop

Circular Razor Fence around the Crop

Physical barriers

Wild boar is an animal with very poor sight and hearing abilities. This particular character is exploited for developing certain types of physical barriers to save the crops from this noxious animal.

Barbed wire fence: Erecting of barbed wire around the field in three rows with first row is at the height of 1 feet from the ground is one of the most validated type of physical barrier to prevent wild boars entering into the cropped area. The cost of such barrier has also been calculated and was found economical (Barbed wire Rs: 6,855 to 7,000; Labor cost Rs: 1,000; total cost per acre Rs: 8,000)

Circular razor fence

The iron wire fixed with sharp razor blades at regular distance is kept 1 ft away from the cropped area as border by forming circular rings. The blades caused serious damage to the wild boar which tries to enter into the field. This not only prevents the animal to enter into the field but also scares away other animals. The entangled animal makes alarm calls which deter away the other wild boars, thereby saving the entire crop without any damage.

The cost involved per acre will be Rs: 19,000 (Rs. 18,000 for the wire + Rs.1000 labor) in fixing this type of physical barrier.

Physical Barriers

Chain Link Fence around the Crop

Solar Fence around the Crop

Chain link fence

It is an easy most effective way of fixing a barrier which is more durable in nature. Chain link meshes of 3 feet height can be fixed around the crop by maintaining a distance of 1 ft away from the crop. The cost of the chain link fence needed for 1 acre will ranging between Rs: 10,000 - 10,500 and the labor cost for fixing worked out to be Rs: 1,000 per acre.

Solar fence

This is a permanent type of physical barrier arranged around the cropped area which is gaining more popularity in the present times. This method is being widely practiced to prevent the damage by wild boar in high valued remunerative crops. In this method a solar fence is fixed around the crop with 12 volts electricity being sent into the fence with the help of solar plates. The shock received by the animal during the contact will not be capable of killing the animal but certainly ward off not only the animal which comes in contact but also other following animals which will be scared due to the alarm calls of the shocked animal. The cost if the fence per acre is worked out to be Rs: 90,000 inclusive of Rs: 3,000 as labor charges for erecting.

Physical Barriers

G. I. Wire Fence around the Crop

Trenches around the Crop

GI wire fence

A simple GI wire can also be used to create physical barrier for wild boars where three rows of GI wire fixed around the crop with the help of poles with a height of 1 feet from the ground level. This method is comparatively simple and economical method as compared to other barriers. The animal by coming in contact with GI wire feels threatened and gets scared away by confusing the GI wires with electric fences. The cost involved per acre is around Rs: 2,000 including the Rs: 1,000 for labor cost.

Trench method

Digging of 2 ft wide and 1 ½ feet deep trench around the cropped area at a distance 1 ft from the crop keeps away the wild boars from the field. This method also helps as an excellent source for water conservation in the rain fed areas despite being effective method for wild boar management. This method gives additional advantage of preventing the damage of the crop by insect pests which are migratory in nature from one field to other field.

Biological Barriers

Safflower (Four Thick Rows) around Ground Nut Crop

Castor (Four Thick Rows) around Maize Crop

Biological Barriers

To avoid additional expenditure in the name of physical barriers, extensive studies were undertaken by AINP on Agricultural Ornithology to utilize naturally occurring shrubs / plants / crops as physical barriers in the name of Bio fencing. Bio fences are useful not only as protective barriers but are also eco friendly in nature giving additional income to the farmer through their produce.

Four rows of Safflower around the crop

The practice of having 4-5 rows of safflower crop as border crop around ground nut found to be most promising in preventing the damage by wild boar. Safflower crop by being thorny in nature will cause great amount of inconvenience and damage to wild boar especially under situations when it is sown in closed spacing. In addition, safflower crop emits strong chemical odour effectively masking the odours emitted by ground nut crop. Due to this, wild boar at the first instance will fail in locating the ground nut crop, secondly even if it is locates the thorns of the safflower plant causes mechanical injury or damage, thereby they will not try to enter into the ground nut field. Additional income realized through safflower crop comes as an added advantage to the farmer.

Four rows of castor around the crop

This method is widely being popularized in maize crop by planting 4-5 rows of castor with close spacing around the maize crop. Wild boars being capable of identifying maize only through smell cannot do so owing to the strong odour emitted by the castor successfully masking the odour emitted by the maize crop. Damage in castor by wild boar is also not possible due to the non palatable nature of the plants with high amount of alkaloids and glucosides. Through this method farmer also is benefitted with additional income through castor. Useage of castor as border crop is practicable in both *kharif* and *rabi* seasons and the same crop can be used as border crop in crops like pulses and oil seeds.

Biological Barriers

Thorny Bushes & Cacti Shrubs around the Crop

Close Planting of *karanda* around the Crop

Planting of thorny bushes and xerophytes around the crop

Different xerophytic species like Cacti sp *Euphorbia caducifolia, E. meriifolia* & opentia sp *Opuntia elatior, O. dillenii*, Zizipus sp *Ziziphus oenopolia, Z. mauritiana*, and agave sp *Agave americana, Caesalpinia cristata* can be planted on the bunds around the crop which will not allow the wild boars due to their thorny nature. The wild boars after unsuccessful trail of entry get injuries and make alarming calls, which makes the other animals to flee the scene.

Planting of *Karanda* around the crop

Planting of *karanda* (*Carrissa carandus*) around the crop as Bio fence does prevent effectively the entry of wild boars into the cropped area owing the thorny nature. Using *karanda* as a border crop gives enormous benefits to the farmer by giving value added products, extract of medical important, effective alternative to tamarind etc., in addition to fulfilling of basic purpose of wild boar prevention.

Chemical Barriers

Hanging of the mixture (sand + thimet or phorate granules) in a thin cloth/plastic bags around the crop

Spraying of egg solution around the crop

Chemical Barriers

Wild boar management through chemical methods must be cautious and strategic. Even though it is easy to kill wild boar through many of the chemical methods which are easily available they cannot be practiced due to listing of wild boars in schedule III of Wild Life Protection Act 1972. The following are the some of such chemical methods that are worked out to manage the wild boars truly under the limits of Wild Life Protection Act.

Use of Phorate/Thimet granules

Phorate / Thimet pesticide is having strong smell of chemical which is exploited under this method to mask the original smell of the crop acting as guiding source for wild boar attack. About, 200 gms of Phorate / Thimet mixed with 1 kg of sand is tied in perforated polythene bags and are arranged around the crop at the distance of 3 mts maintaining the height of 60-100 cm from the ground level. Slow release of the smell of Phorate / Thimet by wind currents through polythene perforation will prevent successfully the wild boar attack. As in earlier cases strong smell of Phorate / Thimet will also help in the masking of natural smell of the crop, there by confusing the wild boars in locating the crop.

Spraying of egg solution

By exploiting the habit of the wild boar using smell of the crop as criteria for identification, an extensive level of experiments were carried out to use spray of egg solution either on the border row of the crop or on the wet soil around the crop. The results has given a clearcut indication that spray of egg solution 20 ml/lt of water was capable of successfully masking the natural odour of the crop and thereby reducing the wild boar damage. By being exclusively eco friendly this method is highly economical with only Rs: 300 spent for acre. In case of severe damage two sprays are recommended with 10 days interval.

Chemical Barriers

Fixing of Cotton niwar soakedwith kerosene around the crop

Erection of coconut ropes coated with mixture of pig oil and sulphur

Arrangement of Three rows in Niwar soaked in Kerosene

The niwar should be soaked in Kerosene solution for about 2 hrs and will be arranged around the crop in 3 rows by keeping 1 ft distance between rows with the help of wooden poles. Sufficient care should be taken to drain off excess kerosene. The dominating smell of the kerosene does not allow wild boars to identify the crop. This method is generally effective for 10-15 days.

Arrangements of Coconut ropes soaked in mixture of Sulphur + Pig oil.

Arrangement of coconut rope, in three rows around the crop by keeping 1 ft distance between the rows with the help of wooden poles is done for wild boar management. Preparation of solution with sufficient quantity of sulphur is mixed with local / domestic Pig oil is done and that mixture will be smeared on the arranged coconut ropes. This mixture generates the typical smell there by repelling wild boars not to enter into the cropped area. For an effective use of this method, two such applications should be done with 10 days internal in between.

Chemical Barriers

Poison baits around the crop

Gonadotropin baits for reduction in the population

Poison Baits

Use of poison baits with non lethal doses of mono floro acetate (0.025 %) or warfarin (0.025%) cause stomach irritation in wild boars after consumption. However, pre-baiting with 100 gms of wheat flour mixed in onion & garlic paste should be done continuously for a about 3 - 4 days by keeping 10-15 baits on field bunds, which makes the wild boar to feed on the same bait mixed with mono floro acetate or warfarin after the prebait period. After successful baiting, the leftover of the poison baits must be removed to avoid accidental exposure of non target organism to such baits.

Gonadotropin baits

Gonadotropin releasing hormone (GnRH) is a contraceptive vaccine which interrupts the hormonal process leading to ovulation and sperm production. Similar bait method with prebaiting scheduled by using 100 gms of wheat flour mixed with onion and garlic paste should be done for first 3-4 days and on 5th day single shot Gonadotropin releasing hormone (GnRH) should be added for the desired intake by the wild boar. Due to this the reproductive ability of the wild boar gets affected negatively their by leading to reduction in the population of wild boars.

Traditional methods

Spraying of dung solution of local pigs around the crop

Spreading of human hair as thin layer around the crop

Traditional methods

Several ITKs are being employed by the farming community to ward off wild boars in different innovative ways. Some of such effective ways, practiced by local people were scientifically evaluated and validated for efficiency and economic feasibility. The following are the some of such methods which are being recommended through AINP on Agricultural Ornithology.

Spraying of dung solution of local pigs

Territoriality is very high in wild boars which are being exploited under this method. The dung collected from local pigs will be made into solution and will be sprayed on soil to the width of 1 ft around the crop. This will confuse wild boars with a false assumption of entering into the territory of other pigs, there by their movement will be prevented to avoid territorial conflict. For sustained affectivity it is desirable to go for 2-3 sprays with 7 days interval between each spray.

Human Hair as respiratory deterrent:-

Wild boar with poorly developed sight and hearing mechanism has to depend on its t smell sensory mechanism only for movement as well as locating of food. In this process it moves from one place to other place only by a way of sniffing on the ground there by getting guided in to the desired routes. Spreading of human hair collected from local barber shops is an effective and low cost traditional method being followed by farmers. Technically this indigenous method do have scientific logic which clearly suggest that the human hair in the movement route of the wild boar gets sucked through nostrils causing severe respiratory irritation. Due to this, the wild boar gets totally disturbed and loses its track by making distress calls, which will ward off other wild boars entering into the cropped area.

Traditional methods

Placement of used color sarees as barriers

Burning of dried dung cakes of local pigs

Fixing of used colored sarees:-

This method also is a farmers innovation, which has a behavioural background as far as wild boar is concerned. By arranging used sarees of different colors around the crop will make wild boars to falsely assume human presence in the area there by not preferring to enter into such areas. Even though not feasible in all situations, it has some marginal benefit in the areas of human movement.

Burning of dried dung cakes:-

The dried cakes made from dung of local pigs are burnt by placing them in earthen pots. This will ensure slow generation and spread smoke during dusk time. The smoke coupled with smell of local pig dung helps in sensitizing wild boar about the un existing presence of local pigs. As a result, to avoid territorial conflict, the wild boars don't prefer to move into such areas.

Traditional methods

Creation of sounds by using crackers for scaring wild boars

Bonfires for scaring wild boars

Creation of sounds and light through bonfire

To scare away the wild boars from damaging their crops farmers employ methods such as using fire crackers, making sounds through local drums, empty tins, making bonfires and shouting. These types of methods proven to be affective on community basis in protecting farmers fields from the wild boars.

Use of trained local dogs for scaring away wild boars

In endemic areas of wild boar attacks, farmers do follow using of trained dogs on a community basis to scare away the approaching wild boars. In selected cases this method proved to be effective and sustainable.

Local dogs for scaring away wild boars

provision of alternative food in the original habitats

Hunting and killing of wild boars by different ways
is an offence as per wild life protection act

It is a punishable act to hunt / kill the wild animals in India under Wild Life Protection Act, 1972 and Bio Diversity Act 2004. However, wherever there is a problem of wild animal becoming an economic pest of the cultivated crops Government of India and Forest Department of concerned states has developed certain guidelines on the basis of which an animal can be declared as vermin on the basis of degree of damage caused. Once declared as vermin there is relaxation in the law that it can be killed to avoid such loss to the farmers but necessarily in the presence of forests officials.

Photo : Sanjay Shrishrimal